RESULTS OF

SECONDARY CONTAINMENT PERFORMANCE SURVEY

December 2006

GENERAL INFORMATION

The survey[1] was mailed to approximately 280 underground storage tank (UST) service technicians, tank testers, secondary containment testing contractors, and local agencies. Although many concerns were expressed verbally to the State Water Resources Control Board regarding the consistent implementation of secondary containment testing, a disappointing number of written surveys (44) were completed. Information on survey respondents is summarized below in Table 1.

Table 1- Survey Respondent Affiliation and Experience

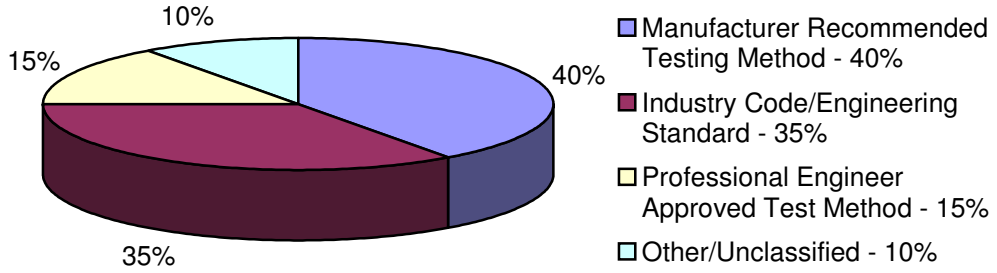
Affiliation	Number of Respondents	Number of Observed UST Secondary Tests
Local Agency Inspector	24	1728
Technician/Service Company	14	2828
Owner/Operator	3	306
Unclassified	3	150
Total	**44**	**5012**

SECONDARY CONTAINMENT TESTING IMPLEMENTATION

California regulations require that secondary containment testing be conducted using a test procedure to demonstrate the system performs at least as well as it did upon installation. The regulations also require that secondary containment testing be performed in accordance with manufacturers' guidelines or industry standards. If there are no applicable guidelines or standards, a test method approved by a registered PE may be used. [California Code of Regulations, Title 23, section 2637 (a)(2).] The following is a breakdown of the reported secondary containment testing implementation:

- **Test Methods.** Typically, hydrostatic test methods were used for sumps and under dispenser containment (UDCs), while vacuum and pressure methods were used for tanks and piping. Survey results indicate that test methods used were inconsistent, varying from one service technician to the next. In addition, acceptable test methods varied from one local agency jurisdiction to the next. Figure 1 shows the distribution of methods used to test secondary containment systems.

Figure 1: Survey Distribution of Secondary Containment Test Methods



[1] See attachment for a copy of the letter and survey form.

- **Cleaning and Pre-Testing.** There are no specific guidelines or requirements for cleaning and pre-testing of secondary containment components before conducting the required secondary containment test. However, most owners/operators had contractors clean sumps and UDCs before testing because doing so minimized the amount of hazardous waste generated during the test (see figure 2).

  Owners/operators that were concerned their systems might fail the required test elected to pre-test sumps and UDCs to increase the probability that the system would pass the required secondary containment test at the required time (see figure 3). Reported failure rates may be lower because failed systems were repaired before the required secondary containment test.

Figure 2: Percentage of owners/operators who cleaned sumps and UDCs prior to testing.

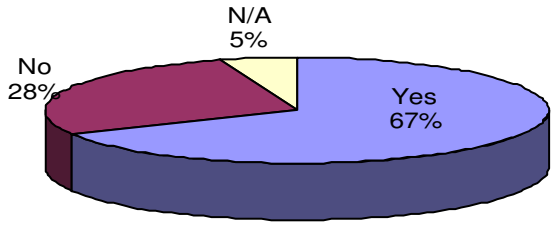
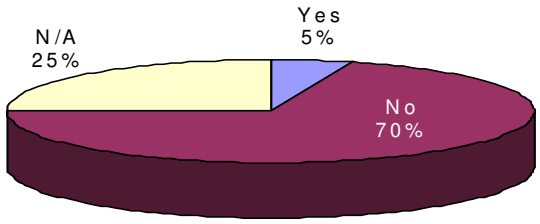
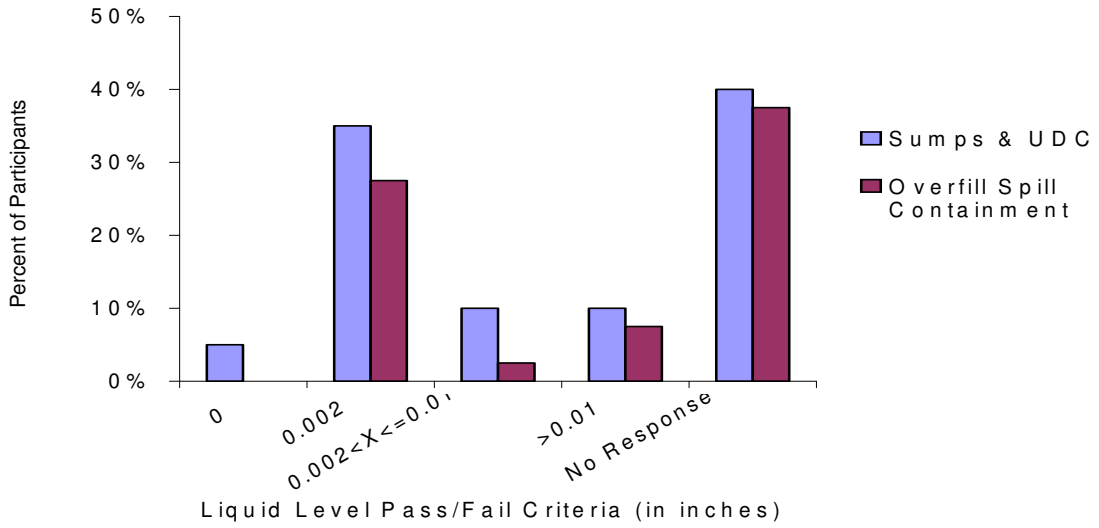


Figure 3: Percentage of owners/operators who pre-tested sumps and UDCs.



- **Test Pass/Fail Criteria.** The survey acquired information on the pass/fail criteria used to evaluate the integrity of secondary containment. Figure 4 shows the pass/fail criteria used in hydrostatic tests of sumps and UDCs. For example, 35% of respondents reported a level change of 0.002 inches above or below the initial water level measurement was used as the pass/fail criteria for sumps and UDCs. Concurrently, 28% of respondents reported the same level change of 0.002 inches as the pass/fail criteria of overfill spill containment.

Figure 4- Survey-Reported Range of Pass/Fail Criteria Used in Hydrostatic Tests



- **Test Duration.** Depending on the testing method, test time varied from 15 minutes to 24 hours. An average 30-minute hydrostatic test was used to test sumps and UDCs and an average 60 minute vacuum or pressure test was used for piping and tank evaluations. Table 2 shows the average time, in minutes, for the various methods.

Table 2- Survey-Results for Estimated Test Time (in minutes) for Each Test Method

Test Procedure	Avg. Tank Test	Avg. Piping Test	Avg. Sump Test	Avg. UDC Test	Avg. Overfill Spill Containment Test
Hydrostatic	NA	NA	30	30	30
Pressure	60	60	NA	NA	NA
Vacuum	60	60	NA	NA	NA
NA = Not applicable.					

SECONDARY CONTAINMENT FAILURES

The most commonly reported secondary containment failures came from points at which two field installed components were joined together, such as the piping penetration into the sump or UDC. This failure is reflected in approximately 80% of survey responses. Table 3 shows the distribution of most common failure points by secondary containment component.

Figure 5: Failed penetration fittings and material degradation of piping

Table 3- Survey-Reported Distribution of Most Common Failure Point

Secondary Containment Component	Most Common Failure Point	Second Most Common Failure Point
Tank	Interstitial sensor riser	Tank top fitting
Piping	Termination point/boot	Breach in secondary & pipe coupling/connection
Sump	Penetration fitting (side-wall fitting)	Electrical conduit
UDC	Penetration fitting (side-wall fitting)	Electrical conduit
Overfill Spill Containment	Drain valve	Containment breach

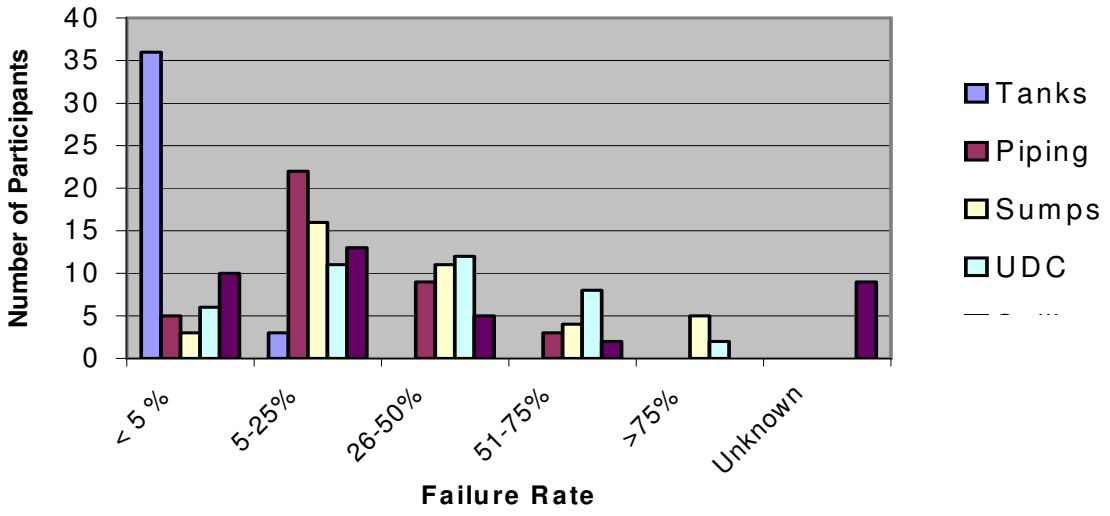
The primary reason for a failed test, as cited by respondents of the survey, was improper installation of components. The second most common reason for failure was material degradation. Material degradation may not necessarily mean the degradation of the secondary containment structure itself (tanks, piping, sumps, UDCs), but may refer to another, non-integral component such as penetration fittings or termination boots. Table 4 shows the distribution of the most common reason for the secondary containment testing failures.

Table 4- Survey-Reported Distribution of Most Common Reason for Failure

Secondary Containment Component	Most Common Reason	Second Most Common Reason
Tank	Poor design	Improper installation
Piping	Improper installation	Poor design
Sump	Improper installation	Material degradation
UDC	Improper installation	Material degradation
Overfill Spill Containment	Improper installation	Material degradation

- **FAILURE RATE BY COMPONENT.** The survey identified the frequency of failure rates for secondary containment components. Figure 6 illustrates the number of survey respondents who reported failure rates of secondary containment components. The results of the survey show that the secondary containment of tanks had the lowest failure rate.

Figure 6 – Survey-Reported Failure Rate for Each Secondary Containment Component



- **FAILURE RATE BY COMPONENT MATERIAL.** Secondary containment components are constructed using a wide variety of materials [e.g., fiberglass, steel, high density polyethylene (HDPE), etc.]. The survey results indicate that certain material types show widespread failure during secondary containment testing with thermoplastic flexible piping having the highest failure rate. Table 5 shows the two materials that most frequently failed secondary containment testing. Note that this does not take into consideration the frequency of material use.

Table 5- Survey-Reported Distribution of Materials that Most Commonly Fail Secondary Containment Testing

Secondary Containment Component	Most Common Material Failure	Second Most Common Material Failure
Tank	Jacketed	Fiberglass
Piping	Thermoplastic	Fiberglass
Sump	Fiberglass	HDPE
UDC	Coated steel	Fiberglass